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CONTENTS

NEW BASIS FOR ELECTRICAL UNITS

The minutes of the 1929 session of the International Committee of Weights and Measures, which have just been issued, record a definite step toward the adoption of electrical units consistent with those used in mechanics, and the establishment of a permanent means of coordination between the laboratories which maintain the units in different countries. The committee also decided to take up the question of a uniform international unit of light.

On the subject of electrical units and standards, the international committee had before it an extensive report prepared under the direction of an advisory committee on electricity. This international advisory committee consisted of 10 members, including representatives of 6 national standardizing laboratories. It was appointed in 1928, and, through national advisory committees and other organizations, secured practically a world-wide consensus of opinions on this subject. Its conclusions were in full accord with recommendations made by the American committee, and the report was prepared by the representative of the Bureau of Standards, Dr. George K. Burgess.

In accordance with the recommendations of the advisory committee, the international committee at its regular biennial session held at Paris in June, 1929, adopted resolutions translated as follows:

A. With regard to the system of units:

1. Considering the great importance of unifying the systems of electrical measurements on a basis free from all arbitrary characteristics, the absolute system, derived from the c. g. s. system, ought to be substituted for the international units for all scientific and industrial measurements.

2. Since it is not possible at the present time to fix with the exactness which is desirable, and of which they are susceptible, the ratios between the absolute units derived from the c. g. s. system and the international units of current, of electromotive force, and of resistance, as these were defined by the International Congress at Chicago in 1893 and the London Conference in 1908, the committee expresses the wish that researches be pursued to this end in the laboratories which are suitably equipped, following a program previously studied in accord with the advisory committee on electricity.

B. The International Bureau of Weights and Measures will establish—

1. An organization to arrange for systematic interchange of standards and to assure the compilation of the results of comparisons made by the national laboratories.

2. A laboratory to which material standards representing the results obtained in different countries can be brought for precise comparisons.

3. A depository for reference standards and working standards, including standards of inductance and capacitance, with the apparatus necessary for the comparison of other standards with those of the bureau.

C. The International Committee on Weights and Measures, under the authority given it by the general conference, will have the responsibility of deciding and of promulgating the values to be employed for the practical standards and will determine the date of a new revision. To this end, and for the arrangement of experimental determinations and the analyses of their results, the advisory committee will continue to give its counsel to the international committee in the exercise of the functions which the general conference has

delegated to the latter committee. The International Committee on Weights and Measures will draw up by-laws to govern the organization and functions of the advisory committee.

D. The International Committee on Weights and Measures will take up with the proper authorities such measures as are necessary to obtain special facilities for the passage across frontiers of packages containing standards, whether accompanied or not.

The by-laws mentioned under paragraph C were also provisionally adopted, but are not to be published until the advistory committee meets again.

Referring to the lack of concordance between the candlepower standards of different countries, the committee adopted the following resolutions:

1. The International Committee on Weights and Measures, considering the importance of unifying the methods used in photometry, decides to study the question of the adoption of an international system of units of light.
2. For this purpose, the international committee charges the advisory committee on electricity to advise it on all questions relating to the methods of measurement and to the units and standards of light.
3. The International Committee on Weights and Measures authorizes the advisory committee to solicit, for the study of these questions, the collaboration of the International Commission on Illumination.

It was also decided that the advisory committee would be asked to meet again in about a year to consider the question of photometry and the installation of electrical laboratories at the International Bureau of Weights and Measures.

DIRECTIVE RADIOBEACON SYSTEM

With the aural type directive radiobeacon system now in use on the airways of the United States, it is the practice to operate the radiobeacon and radiotelephone weather broadcast stations on the same radio-frequency, interrupting one service when the other is in use. This permits the pilot to use these services without the necessity of retuning the radio receiving set from the beacon to the phone service or vice versa. The two services are, however, not available simultaneously.

It would be advantageous if the pilot could have available his course indication even while listening to the weather broadcast. The visual type of radiobeacon offers possibilities for the simultaneous transmission of the two services on the same radio-frequency. The modulation frequencies used with the visual beacon are 65, 86.7, and 108.3 cycles, respectively. Intelligible speech does not require modulation frequencies below 300 cycles. The two sets of modulation frequencies may therefore be transmitted on the same carrier frequency. On the airplane a receiving set tuned to the transmitted carrier frequency may be employed, and a suitable filter circuit arrangement provided in the receiving set output so that the frequencies above 300 cycles are supplied to the head telephones and those below 300 cycles to the vibrating reed-course indicator. The bureau is making a study of the most practicable transmitting circuit arrangements for the simultaneous transmission of the radiobeacon and radiotelephone signals. Preliminary experiments to test the practicability of these arrangements have been started.

VIBRATING REED-COURSE INDICATOR

The vibrating reed-course indicator (used with the visual-type radiobeacon) has heretofore been mounted on airplane instrument boards at least 18 inches from the magnetic compass, so as to avoid any effect upon the compass readings.

Recent experiments at the bureau have shown that such a separation is unnecessary if sheet iron is used for the external mounting of the reed indicator. Preliminary measurements show that the indicator may then be located within 3 inches of the magnetic compass without affecting the compass readings.

EFFECT OF ULTRA-VIOLET RADIATION UPON THE TRANSMISSION OF SPECIAL WINDOW GLASSES

For the past two years the Bureau of Standards has been making an extensive study of the effect of ultra-violet light upon the transparency of window glasses and glass substitutes to be used for transmitting short wave length ultraviolet radiation (1) from artificial sources and (2) from the sun. Part of the information thus obtained is given in Bureau of Standards Journal of Research, Vol. 3, No. 5, p. 629; November, 1929. The reprints of this article, Research Paper No. 113, will soon be available from the Superintendent of Documents, Government Printing Office, Washington, D. C.

One of the high points recorded in this paper is that some of these glasses and glass substitutes undergo a photochemical change, with a marked decrease in the transmission of ultra-violet radiation, which renders them unsuitable for filters of artificial sources of radiation.

Another point of interest mentioned in that paper is that the unfiltered radiation from artificial sources seemed to produce a somewhat greater decrease in transmission than sunlight, but that sufficient time (one year) had not elapsed to determine whether the glasses which were exposed to the sun had attained a minimum transmission.

From a further study of these various makes of glasses which have now been exposed to the sun and weather continuously for 1½ to 2 years (some samples were exposed through 2 winters and 2 summers) it appears that, within the experimental errors of observation and handling such material, there is no appreciable recovery or increase in transmission in winter above the minimum value attained in summer; also that it requires an exposure of 3 to 4 months to the hot summer sun and weather to make certain that solarization is fairly complete, especially in some makes of glass that solarize but slowly.

After this initial solarization an exposure of these glasses to the mercury arc lamp produces a further decrease in transmission, varying from 1 to 8 per cent at 302 millimicrons, depending upon the sample tested. The difference in the decrease in transmission produced by these two methods of so-called photochemical stabilization is small, averaging less than 6 per cent for the earlier productions of Helioglass, Holviglass, Sunlit, and Vitaglass, and it does not modify the rating of the relative performance of these glasses (see Table 2, of Research Paper No. 113) in which the public is interested. For example, the average transmission of the samples of Helioglass described in Table 2 of Reserach Paper No. 113, after stabilization by exposure to the sun would be expected to be 46 per cent as compared with 40 per cent under the mercury arc.

As mentioned on page 652 of Research Paper No. 113, the stablization tests under the mercury lamp indicated that the newer productions of Helioglass and Vitaglass showed an improvement in transparency. This has now been verified by exposure of these glasses to the sun for 10 months. For example, the sample of Vitaglass, which transmitted 62 per cent when new, decreased in transmission to 43 per cent after solarization for 10 months and to 30 per cent after exposure to the mercury lamp. Similarly, a recent production of Helioglass transmitted 68 per cent when new, 59 per cent after solarization for 10 months, and 46 per cent after exposure to the mercury arc—a difference of about 13 per cent produced by these two methods of depreciation. It is interesting to note that the relative performance of these glasses remains the same.

Recently it was found by Wood and Leathwood (Nature, September 21, 1929) and by the Bureau of Standards that exposure of the glass to the sun after exposure to the mercury arc lamp increases the transmission in the ultraviolet to closely the minimum value that was obtained by exposure only to the sun. In fact, in the Bureau of Standards' tests, which were made on glasses that had been exposed to the sun for a long time before exposure to the mercury arc, it was found that, on further exposure of these glasses to the sun, after exposure to the lamp, the transmission increased to a higher value than the minimum attained by exposure only to the sun. This overshooting in transmission, which ranges from 1 to about 6 per cent above the minimum attained by exposure only to sunlight, occurred in 17 out of 20 samples of different makes of glass, including Helioglass, Holviglass, Neuglas, Ultra-Violet Glass, Ultravit, and Vitaglass. Whether this condition remains permanent will require measurements on these glasses after exposure to the sun, especially during the summer.

This recovery in transmission appears to be selective to certain wave lengths of the exciting light. For example, one sample of glass was exposed to the mercury arc and then cut into nine pieces, one of which was exposed directly to the sun. The others were exposed under black paper (opaque to all rays) and under filters which transmitted bands of infra-red, red, yellow, green, blue, violet, and ultra-violet rays of the sun. The recovery in transmission was practically the same under all these filters except the ultra-violet, Corex G986A, which produced the greatest recovery, and Corning pale blue green, G584, which produced the second greatest recovery. From this it appears that the spectral region of 365 millimicrons produces the greatest recovery in transmission.

It is to be noted that all these depreciation tests on different kinds of glass were made in duplicate, by exposure (1) to the mercury arc lamp (and other artificial light sources) and (2) to the sun, and that in all makes of glass (except Corex A) a close similarity was found in the depreciation in transmission produced by these two sources of ultra-violet radiation. That is to say, glasses (for example, Corex D), which undergo little or no change in transmission on exposure to the mercury arc, undergo no appreciable change in transmission on exposure to the sun; and glasses, also different melts of the same kind of glass, which show the greatest decrease in transmission on exposure to the mercury arc, show the greatest decrease in transmission on exposure to the sun. All deductions regarding the depreciation in transmission of different makes of glass and different melts of the same kind of glass are based upon experiments in sun-

light, supplemented by experiments with artificial sources of radiation, leaving no doubts regarding their performance.

It seems impracticable to spend several months (preferably summer) in order to obtain the performance of every melt of glass by exposure to the sun. The depreciation in transmission by exposure to the mercury arc appears to be a little more severe than sunlight. But in view of the fact that differences of 10 to 22 per cent in transmission are found in new samples of certain kinds of glass, selected at random from the same shipment (and presumably from the same melt), the mercury arc appears to be a ready means for determining, in a few (three to five) hours, the so-called stabilized transmissive properties of a batch of glass. From these data, and from the above-mentioned corrections, the transmission that it will probably attain after solarization by prolonged exposure to the sun can be predicted.

ACCELERATED WEATHERING OF PAINTS

A comparison of outdoor and accelerated (combined light-spray only) exposures of the same white paints is giving some interesting information. The paints under test are white lead, lead-zinc, and lithopone. Thus far results have been obtained on six weeks of exposure in the accelerated cycle, taking a set of panels out at the end of every week. The white-lead paints are failing by chalking, fine checking, and a gradual disappearance of the paint coat (by chalking off). The lead-zinc paints are failing by cracking, resulting in a flaking or crumbling of the paint coat. The lithopone paints chalk heavily, crack, and soon disappear from the wood. White lead shows up the best, lead-zinc next, and lithopone a poor third. Lithopone paint fails in about three weeks and lead-zinc in about five weeks. The white-lead paints have not reached (after six weeks' exposure) as bad a condition as the lithopone paints at the end of three weeks. A comparison, on a quantitative basis, of the relative merits of these paints is difficult, because of the different types of failure for the various paints. Using three weeks as the period of failure for the lithopone paints, the other paints appear to be in somewhat the following ratio at the present time:

Lithophone paint, 3.
Lead-zinc paint, 5.
White-lead paint, more than 6.

PERMANENCE OF PAPERS

In response to urgent demand from a number of sources—paper manufacturers, paper dealers, librarians, publishers, scientific organizations, and the public in general—the Bureau of Standards instituted a research to find more definite information on the permanence qualities of papers used for written and printed records and on the preservation of such records.

The program adopted was made up of (1) tests of the current commercial rag fiber and wood fiber products, including the fibrous raw materials; (2) tests of similar papers made in the bureau's paper mill and, therefore, having a definitely known history; (3) inspections and tests of papers of known age; (4) a study of means of overcoming influences found to be harmful to the life of papers; and (5) research to find the nature of the reaction of paper celluloses to deteriorating influences.

Some work has been done on item No. 1, and a progress report A Study of Purified Wood Fibers as a Paper Making Material published in the Bureau of Standards Journal of Research, Vol. 3, No. 3, p. 469; September, 1929 (Research Paper No. 107).

Work is now in progress on item No. 2 of the program. The types of papers to be made are (1) sulphite-soda book, (2) sulphite bond, (3) bond made from purified wood fibers, and (4) five grades of rag writing and bond papers, using all the various grades of rags. The objectives of this work are (1) to make the best papers possible from the various fibrous materials, so as to obtain a more exact comparison of the paper-making quality of the raw materials than is possible with commercial papers, and (2) to introduce variables suspected of being harmful, such as overbleaching, high acidity, and overbeating, for the purpose of observing their effects on the different fibrous materials.

Intensive study of items (3) and (4) has been made possible by a fund granted by the Carnegie Foundation, which is particularly interested in the preservation of publications. This fund is being administered by the National Research Council. Surveys of public libraries to correlate deteriorative effects with storage conditions are in progress, and laboratory studies of the deteriorating effects indicated by the library surveys are being initiated.

The obvious point of attack on item (5) is to find more definitely the nature of the products formed by degradation of cellulose. With this information, a study of the mechanism of the degradation will be the next logical step. A knowledge of these facts will enable the bureau (1) to inhibit or delay degrada-

tion, or (2) to predict whether or not degradation will occur. Fundamental physical and chemical studies of cellulose are being initiated for this phase of the work.

SPONGE RUBBER

The bureau has recently completed a study of the properties of soft sponge rubber as commercially manufactured. Thirteen different samples of sheet material were secured and data obtained with respect to the following:

Weight per unit volume, hardness, porosity, tensile strength, and elongation, permanent "set," buoyancy in water, hysteresis under compression and impact, and thermal conductivity.

The results of this work are published as Circular No. 377, entitled "Some Properties of Sponge Rubber." Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

SPECIFICATION FOR RIGGING LEATHER

An investigation was made relative to the properties of rigging leather previously covered by Federal specification No. 483, and largely used in shipbuilding for such miscellaneous purposes as wrapping chains and oars and lining boat cradles. Difficulties had been experienced in securing leather to meet the water absorption and stretch requirements of the specification.

Tests made on 11 representative samples of commercial leathers showed that the water absorption in 30 minutes varied from 6.23 to 42.4 per cent as compared with the specification requirement of 20 per cent as a maximum. Eight of the eleven samples had a water absorption of more than 30 per cent. An attempt to correlate the results with the percentages of grease contained in the leathers was not successful in that no relation appeared to exist. All the samples contained more grease than the maximum amount allowed by the specification.

With respect to the percentage of stretch at a load of 2,500 lbs./in.^{2} 10 of the 11 samples showed a value between 15 and 20 per cent as compared with a maximum allowance of 15 per cent.

As a result of these tests, the specification has been revised in order to bring its requirements into accord with good commercial practice and allow the purchasing agencies a wider market for procurement. The following changes were made:

1. Insertion of a requirement that the maximum moisture content of the leather shall not exceed 14 per cent.
2. Elimination of the water absorption requirement.
3. Increase in the maximum percentage of stretch allowed from 15 to 20 per cent.
4. Increase in the grease content required from a range of 6 to 12 per cent in the old specification to a range of 12 to 18 per cent in the new specification.
5. In describing the selection of the leather as to defects, "three open surface scratches" was included as one of the alternate defects allowable.

The revised specification for rigging leather (Federal specification No. 483a) was issued in pamphlet form by the bureau on October 21, 1929. Copies may be secured for 5 cents each by addressing the Superintendent of Documents, Government Printing Office, Washington, D. C.

FIBER STRENGTH OF WOOD POLES

The National Electrical Safety Code, in part 2, specifies the allowable fiber stresses which may be borne by wood poles under the stipulated loading specifications. These values are different for different species of wood poles and for different situations of use, and also under some circumstances are different for treated and untreated poles. Definite limits are set at which poles must be replaced when, owing to rot, the useful cross section has been so dimished as to raise the fiber stress to these limits.

The allowable fiber stresses are based upon specified ultimate fiber stresses for the species of wood considered. These ultimate fiber stresses were set at 6,500 lbs./in.^{2} for dense yellow pine; 5,000 lb./in.^{2} for other yellow pine, chestnut, western red cedar, and cypress; and 3,600 lbs./in.^{2} for northern white cedar and redwood. It was recognized that recent experiments and tests would give more reliable values than those just stated, and the following paragraph was therefore placed in the fourth edition of the code:

Tests are under way to determine ultimate stresses of woods, and when values for ultimate stresses have been adopted as standard by the American Engineering Standards Committee the values thus determined shall be applied under this code and the values in Table 20 adjusted proportionately.

A sectional committee working under the procedure of the American Standards Association (formerly the American Engineering Standards Committee) is now preparing specifications for wood poles,

and a subcommittee has been assigned the problem of determining suitable values to be recognized as the ultimate fiber stresses. This subcommittee held a meeting in November, at which it was unanimously agreed to recommend for approval the following values in libs./in.^{2} for ultimate fiber stresses:

Creosoted yellow pine	7,400
Chestnut	6,000
Western red cedar	5,600
Northern white cedar	3,600

It seems probable that these values will be accepted by the sectional committee and approved by the American Standards Association, but their use will not be permissable under the code rules until such approval has been given. In the meantime the present code values will be applicable in those States where public utilities are operating under the rules of the National Electrical Safety Code.

Values for other species of wood are still to be determined by the subcommittee. It should be noted that no distinction is made in the recommended values between classes of yellow pine based upon species or upon density of the individual pole. The value given for yellow pine is intended to be applied to creosoted poles which have been through the usual treating process.

WHITE STAINLESS MINERAL-OIL LUBRICANT FOR TEXTILE KNITTING MACHINES

The hosiery and underwear industries have had considerable difficulty with stains on their fabrics produced by the lubricating oils used on knitting machines. Lubricating oils are used on all movable parts of the machines, various parts of which come in contact with the yarns. It is therefore not practicable to keep the oil off the yarn. Because of the conditions of manufacture, the knitted fabric is stored in bins or boxes before dyeing and finishing. This storage period may cover six or more months, during which time oil stains develop through oxidation of the oil. These stains are very difficult, if not impossible, to remove in subsequent finishing processes.

In the hope of obtaining a stainless lubricating oil a study was undertaken over two years ago by the National Association of Hosiery and Underwear Manufacturers cooperating with the Bureau of Standards through its research associate, E. M. Schenke. The oil refineries were asked to cooperate, and 12 of them submitted 36 different lubricating oils. All of these were submitted to the following tests:

1. Exposure on knitted fabric to daylight for six months.
2. Exposure on knitted fabric to carbon arc lamplight (Fade-Ometer) for 18 hours.
3. Viscosity.
4. Flash point.
5. Corrosion.
6. Neutralization number.
7. Lubricant value.
8. Presence of unsaturates.

These tests have yielded the following tentative specifications:

White Stainless Mineral-Oil Lubricant for All Knitting Machines

(a) Viscosity at 100° F.—Not less than 75 nor more than 100.
(b) Flash point.—Not less than 300° F.
(c) Color.—Must pass the latest edition pharmacopœia specification.
(d) Corrosion test.—A clean copper strip shall not be discolored when submerged in the oil for three hours at 212° F.
(e) The neutralization number shall not exceed 0.10.
(f) Acid test.—Pour 10 cc of the oil into a test tube. Add 5 cc C. P. sulphuric acid, 1.84 specific gravity. The liquids shall remain colorless.

Three of the submitted oils, each from a different refiner, fulfilled the requirements of the tentative specification.

The specification has been submitted to the refiners for comment.

VAPOR PRESSURE AND VAPOR LOCK

A paper on gasoline vapor pressures, presented at the annual meeting of the American Petroleum Institute in Chicago on December 4, was introduced as follows by Dr. H. C. Dickinson, of this bureau.

At least two things are required of every motor-vehicle engine—it must start, and it must keep on running without too many interruptions. The ability to do these two essential things depends partly on the fuel with which it is supplied.

At low temperature, starting is difficult, and gasoline is needed which has an adequate vapor pressure. On the other hand, when the engine and the carburetor float bowl are hot the same gasoline which affords easy starting may fail, causing vapor lock and stopping of the engine.

Doctor Bridgeman and his staff have shown in previous papers that the temperature at which a start can be had may be predicted from the temperature at which 10 per cent of the gasoline is evaporated in the standard distillation test, provided certain constants of the engine are also known.

In this paper he shows that this same point, viz, that at which 10 per cent of the particular sample of gasoline is

evaporated, is a measure of the liquid temperature at which this gasoline starts to boil. If the fuel boils in the carburetor, vapor lock and engine stoppage may be expected. If it never approaches the boiling point, no such trouble is likely to occur. Between the two there is a range of conditions such that a well-designed carburetor and fuel system may avoid trouble while a poor one may cause vapor lock with the same fuel at the same temperature.

The value of this paper and others of the series to the engineer and designer of motor vehicles and to the oil refiner is this: The engine must start readily, for instance, at 0° F. To do so will require a fuel with 10 per cent evaporated at 140°. This fuel will boil if heated above 140° F. If the gasoline in the fuel lines on said engine ever approaches 140° F., vapor lock may occur. Therefore, there are two alternatives; (1) The engineer must so design the fuel lines, pump or vacuum tank, and carburetor that vapor lock will not occur with this fuel, which probably means that the fuel must never reach the 10 per cent point temperature in service; or (2) the user of the engine must have a different grade of gasoline for certain operating conditions.

The present paper offers an accurate means of comparing different gasolines as to their tendency to boil either in automobile fuel systems or in airplane fuel systems at any altitude. Work in progress aims to apply this information in predicting the minimum temperature at which vapor lock may occur. In the meantime the exact temperatures in the fuel lines at which trouble does occur with any given automobile or airplane engine must be found by trial, using fuels of known 10 per cent point.

THERMAL EXPANSION OF SPINEL

Among the refractory materials included in an investigation of the linear thermal expansion of special refractories from atmospheric temperature to 1,800° C. is a sample of spinel. Linear thermal expansion determinations were made on a specimen 6 inches long and 1 inch in cross section cut from a regulation size brick. It must not be inferred that the results obtained represent the true expansion of spinel, since the specimen contains only between 90 and 100 per cent of this mineral. However, the results should prove of value, since they were determined on the grade of material used for refractory purposes.

Petrographic examinations of the material "as received" and after being subjected to a temperature of 1,800° C. gave the following information:

(a) Examination of the specimen "as received" showed that it was composed of isotropic spinel grains with fine particles of glass and a crystalline birefractory material, probably clino-instatite or forsterite. The particles of glass and silicate were generally distributed along the boundaries of the spinel grains but sometimes also as inclusions within the spinel. Spinel comprised at least 90 per cent of the material.

(b) Upon examination after heating to 1,800° C., the spinel grains appeared somewhat larger and the glass grains considerably larger but fewer in number than in (a). The birefringent, crystalline material had practically disappeared.

(c) After heating a second time to 1,800° C. the spinel and glass grains appeared to be slightly larger than in (b).

The material had a uniform rate of expansion from atmospheric temperature to the temperature at which contraction commenced. Although the maximum expansion, 1.195 per cent, occurred at approximately 1,510° C., contraction commenced between 1,300° and 1,400° C. Between 1,510° and 1,800° C. the material contracted, the rate increasing directly as the temperature.

After heating twice to 1,800° C. the material showed little change in expansion, approximating that at 1,400° C. in both cases. However, the maximum expansion, 1,355 per cent, of the reheated specimen was reached at approximately 1,730° C. The material commenced to contract slowly at approximately 1,400° and continued to do so until a temperature of approximately 1,730° C. was reached, after which the rate increased rapidly. The average coefficient of expansion from 20° to 1,400° C. was found to be 8.6×10^{-6}. No deformation was shown by the material. The permanent contraction after the heat treatments was 1.9 per cent. The material gained in weight after heating. At the end of the second run to 1,800° C. it had gained 1 per cent in weight.

ENGLISH CHINA CLAY INVESTIGATION

In the course of an investigation of the physical properties of 17 English china clays a study of the clays in bodies was included. As the study of bodies of 50 parts potters' flint and 50 parts clay had been completed, a study of a body composed of 50 parts clay, 30 parts flint, and 20 parts feldspar was undertaken.

Each of the clays was made up into a body of the composition given, and determinations of water of plasticity, vol-

ume shrinkage, shrinkage water, pore water, bulk specific gravity, and modulus of rupture were made on the unfired bodies. The bodies were fired to five different temperatures, cones 3, 5, 8, 11, and 14, and modulus of rupture determinations have been completed on all of them.

As might be expected, there is a general tendency for the values for water of plasticity, bulk specific gravity, and pore water, as determined on the unfired bodies, to be very nearly the same; approximately 30 per cent for water of plasticity, 24 per cent for pore water, and 1.54 per cent for bulk specific gravity. There is a greater variation in the volume shrinkage, ranging from a value which would indicate a slight expansion rather than a shrinkage to as high as 14.1 per cent shrinkage. Modulus of rupture on the unfired bodies average 27.62 lbs./in.^{2} with a minimum of 5.89 lbs./in.^{2} and a maximum of 52.94 lbs./in.^{2}

The values for modulus of rupture on the fired bodies are somewhat higher for the flint-feldspar-clay bodies than for the flint-clay bodies, due to the fluxing action of the feldspar, especially at the higher temperatures. The average value for the 17 clays increases as the firing temperature increases, going from 626 lbs./in.^{2} at cone 3 to 3,624 lbs./in.^{2} at cone 14.

A comparison of values for the various clays in the different phases of the study shows that the same clays possess superior or inferior strength qualities throughout, regardless of whether they are mixed with other body ingredients or not.

CONSTRUCTION ACTIVITY DURING OCTOBER, 1929

The value of construction contracts awarded in 37 Eastern States during October, 1929, as reported by the F. W. Dodge Corporation, was $445,642,000, approximately the same as during the preceding month, but 25 per cent less than in October, 1928, and lower by 21 and 14 per cent than in 1927 and 1926, respectively. With the exception of commercial buildings, for which contracts awarded were valued at less than 1 per cent more than in October, 1928, public and quasipublic buildings were the only groups in which increases occurred, while 43 per cent declines were indicated for both residential construction and public works and utilities.

The cumulative value of contracts awarded during the first 10 months of the year was $5,064,180,000, a decline of 12 per cent in comparison with $5,731,948,000 in 1928, but only 5½ per cent less than in either 1927 or 1926. Last year's totals for the corresponding period were exceeded only in the Pittsburgh and Minneapolis districts, with the southeastern district, which had been running ahead of last year since June, now falling behind by four-tenths of 1 per cent. Of the principal classes of construction, commercial and industrial contracts were ahead of the 10-month period last year by 6 and 16 per cent, respectively, and public buildings were 73 per cent in excess of last year. Residential building showed about the same relative position as during past months, with a 29 per cent decline. All other classes registered declines from last year.

NEW AND REVISED PUBLICATIONS ISSUED DURING NOVEMBER, 1929

Journal of Research [1]

Bureau of Standards Journal of Research, Vol. 3, No. 5, November, 1929 (RP Nos. 112 to 119, inclusive). Obtainable only by subscription. (See footnote.)

Research Papers [1]

(Reprints from Journal of Research)

RP109. Determination of manganese in steel and iron by the presulphate-arsenite method; H. A. Bright and C. P. Larrabee. Price, 5 cents.

RP110. Determination of fluorine and of silica in glasses and enamels containing fluorine; J. I. Hoffman and G. E. F. Lundell. Price, 5 cents.

Circulars [1]

C376. Thermal insulation of buildings. Price, 5 cents.

C377. Some properties of sponge rubber. Price, 5 cents.

Simplified Practice Recommendations [1]

SPR91–29. Glass containers for preserves, jellies, and apple butter. Price, 5 cents.

[1] Send orders for publications under this heading with remittance only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 25 cents per year (United States and its possessions, Canada, Cuba, Mexico, Newfoundland, and Republic of Panama); other countries, 40 cents. Subscription to Journal of Research, $2.75; other countries, $3.50. Subscription to Commercial Standards Monthly, $1; other countries, $1.25.

Commercial Standards [1]

CS11–29. Regain of mercerized cotton yarns. Price, 5 cents.
CS13–30. Dress patterns. Price, 5 cents.
CS16–29. Wall paper. Price, 5 cents.

Miscellaneous Publications [1]

M98. American national screw thread tables for shop use. I. Standard threads (coarse and fine thread series). Price, 10 cents.
M99. American national screw thread tables for shop use. II. Special threads. Price, 10 cents.
M102. Annual report of Director of the Bureau of Standards to the Secretary of Commerce for the fiscal year ended June 30, 1929. Price, 10 cents.

Federal Specifications [1]

FS483a. Leather, rigging. Price, 5 cents.

Commercial Standards Monthly [1]

CSM. Vol. 6, No. 5, November, 1929. Obtainable only by subscription. (See footnote.)

Technical News Bulletin [1]

TNB152. Technical News Bulletin, December, 1929. Obtainable only by subscription. (See footnote.)

OUTSIDE PUBLICATIONS [2]

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[2] "Outside publications" are not for distribution or sale by the Government. Requests should be sent direct to publishers.

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